Amendments to the Drawings:

The attached drawing sheet includes changes to FIG. 1. This sheet replaces the original sheet. In FIG. 1, the label in box 5 has been changed from "Driver" to "Divider".

REMARKS

This amendment is in response to the Office Action dated December 22, 2006. A Petition for Extension of Time under 37 CFR 1.136(a) (two months) is also enclosed. Entry of this Amendment and reconsideration of this application are respectfully requested.

Oath/Declaration

The Declaration was found to be defective for failing to identify the citizenship of each inventor.

This is not accurate - the Declaration as filed does identify the citizenship of each inventor. A copy of the Declaration as received by the PTO is enclosed; this copy was retrieved via the private PAIR system. The first sentence of the Declaration reads:

We, Osamu ATSUMI and Fumio MITA, declare: We are each citizens of Japan.

As Atsumi and Mita are the only inventors, the Declaration as filed does identify the citizenship of each inventor, and is therefore not defective. Therefore, this finding should be withdrawn, and the Declaration as originally filed should be accepted.

Drawings

Figure 1 was objected to because the label for box 5 should be "Divider" instead of "Driver". The Examiner is correct - this was a typographical error. A replacement sheet is enclosed on which this error has been corrected.

Specification

The abstract of the disclosure was objected to because the Examiner found that it was missing from the original disclosure.

This is incorrect - the abstract was, in fact, included as part of the original application filing. This has been verified using the private PAIR system. If the File Wrapper tab is clicked, followed by the "Claims" link, it is found that the claims occupy the first two pages, and the Abstract is located on the third page. It appears that the pages of the original filing were categorized incorrectly, with the Abstract grouped with the Claims rather than separately.

Therefore, the applicants believe that this finding should be withdrawn, and the Abstract as originally filed should be accepted.

Claim Rejections under 35 USC 101

The Examiner rejected claims 1-6 under 35 U.S.C. §101 as being directed to non-statutory subject matter; the Examiner states that to be statutory, a claim must include a practical application or a useful, concrete and tangible result.

The applicants respectfully submit that claims 1-6 are patentable under 35 U.S.C. §101 as directed to statutory subject matter.

Section 101 of the Patent Act establishes four categories of statutory subject matter: machine, process, manufacture, and composition of matter. An invention may be patented only if it fits within one of the statutory classes of subject matter. State Street Bank & Trust v. Signature Financial Group Inc., 149 F.3d 1368, 1375 n. 9 (Fed.Cir. 1998). In recent years, the courts have greatly broadened the scope of what constitutes statutory subject matter. For example, the court in *State Street* found that the claims at issue in that case were directed to statutory subject

matter because they recited "a practical application of an abstract idea" which produced "a useful, concrete and tangible result".

Synthesizing the guidance offered by the above case and other recent holdings produces the following:

- A practical application of an abstract idea which produces a useful, concrete, and tangible result constitutes patentable subject matter under §101. This criteria is applicable to both apparatus and process claims.
- To be patentable under §101, it is not necessary for a process claim to recite hardware or software components for execution or involvement in the method.
- Abstract ideas, laws of nature and natural phenomena are the only subject matter which have consistently been found to be non-statutory under §101.

The applicants believe that, under the criteria listed above, the claims as originally written are directed to statutory subject matter. There are many known uses for a random number sequence; as such, the generation of such a sequence is a useful and tangible result. However, to further emphasize the usefulness of the claimed invention, the preamble of claim 1 has been amended to specify:

"A random number generation apparatus which produces a random number sequence for which an appearance balance of 1/0 has an equal probability",

and the claim concludes with this language:

"wherein a random number sequence of the smoothed binary pulse sequence code is generated, said un-reversing and reversing polarity ensuring that said random number sequence has an

appearance balance of 1/0 with an equal probability."

As explained in the DESCRIPTION OF THE RELATED ART section of the application:

"To improve security of ID passwords and various kinds of encryption keys, it is necessary that an appearance probability of 1 or 0 (hereafter, called as "1/0") be equal to a probability of ½, and that proper random numbers, in which each bit is independent and there is no correlation between bits, be used."

Thus, the amended claim 1 requires a specific result (a random number sequence for which an appearance balance of 1/0 has an equal probability), which has at least one specific practical application (to improve security of ID passwords and various kinds of encryption keys). This would appear to clearly meet the "useful and tangible result" standard. As such, the applicants submit that claims 1-6 clearly constitute statutory subject matter which is not subject to rejection under §101, and request that the rejection of the claims under §101 be withdrawn.

Note that if the amended claim 1 is found to constitute statutory subject matter, then claims 2-6, each of which depends from claim 1, should also be found to constitute statutory subject matter.

Claim Rejections under 35 USC 102(a)

Claims 1-2 and 4 were rejected as anticipated by a patent to Kogaku et al. In response, claim 1 has been amended to better clarify its differences with respect to the cited art.

As amended, claim 1 is directed to a random number generation apparatus which produces a random number sequence for which an appearance balance of 1/0 has an equal probability. The apparatus comprises:

- random noise generation means for generating random noise by measuring physical noise;
- random pulse wave generation means for generating a random pulse wave by waveshaping the random noise;
- binary pulse sequence conversion means for sampling the random pulse wave with a first clock of a constant period and converting it into a binary pulse sequence of a constant period, which has on/off of the sampled values as a pulse code; and
- binary pulse sequence code smoothing means for un-reversing and reversing polarity of the binary pulse sequence every half period of a second clock which is synchronous with and has a frequency one-half that of said first clock, wherein a random number sequence of the smoothed binary pulse sequence code is generated,
- said un-reversing and reversing polarity ensuring that said random number sequence has an appearance balance of 1/0 with an equal probability.

Thus, as amended, a very specific apparatus is defined which produces a random number sequence - with the further requirement that the generated sequence have an appearance balance of 1/0 with an equal probability.

The concept of a random number generator which is triggered by the occurrence of physical phenomena such as noise, is well-known. This is evident from the cited reference to Kogaku et al., as well as a number of other references. And it is true that Fig. 1 of the Kogaku reference and FIG. 1 of the present application are similar in general appearance. However, when looked at in detail, it is seen that the two approaches are considerably different. As just one example, the Kogaku circuit applies a noise signal to a high pass filter to remove a low frequency component, and the result is applied to a comparator circuit for

linearization, with the ground voltage (0V) as the comparator's reference voltage. In contrast, an apparatus per the present invention does not employ a high pass filter, and the reference voltage (V_{REF}) is selected such that the comparator outputs a '1' when the noise signal level is equal to or higher than a predetermined voltage. The Kogaku reference then describes a means for controlling his reference voltage so as to make the appearance probabilities of sampling values 0 and 1 substantially equal (see his claim 7), whereas the present invention requires no such controlling of V_{REF}.

In addition to the differences noted above, the apparatus recited in the amended claim 1 is substantially different from that described in Kogaku with respect to the "smoothing means" by which the appearance probabilities of 1 and 0 are made equal.

In Kogaku, the smoothing means employs a well-known technique in which an exclusive logical sum of a random number sequence X1, X2, ..., Xn is taken to improve the imbalance between the number of 1s and 0s.

In contrast, in accordance with the amended claim 1, after generating a binary pulse sequence triggered by random noise, a binary pulse sequence code smoothing means operates on the pulse sequence by "un-reversing and reversing polarity of the binary pulse sequence every half period of a second clock which is synchronous with and has a frequency one-half that of said first clock. In short (and with reference to FIG. 2), in the present invention, a binary pulse sequence (p2) synchronous to a first clock (c1) is made from a random pulse wave (p1) generated from random noise (n), and either one or the positive output or negative output of the binary pulse sequence is selected to outputted as a smoothed binary pulse sequence (p3) by periodically reversing the polarity of the binary pulse sequence

(p2) using a second clock (c2). The present invention is characterized in that it can output a smoothed binary pulse sequence, in which the appearance probabilities of 1/0 are substantially equal, irrespective of the deviation of the appearance probabilities of 1/0 of the positive and negative outputs of the binary pulse sequence.

Thus, the present invention has the advantage that, even when there is a deviation of the appearance probabilities of 1/0 of the binary pulse sequence (positive output), the deviation in which 1/0 of the negative output having reverse symmetry is utilized to convert both of them using a clock having a constant period and output the result, thereby canceling the deviation of 1/0 in the binary pulse sequence. Thus, with an apparatus in accordance with the amended claim 1, it is possible to equalize the appearance probabilities of 1/0 of the output smoothed binary pulse sequence, using a smoothing means having a superior equalizing ability. This technique and its advantages are further described in the specification from page 10, line 27 to page 13, line 5.

Kogaku neither discloses nor suggests a smoothing means as described in the amended claim 1. Specifically, Kogaku fails to disclose a binary pulse sequence code smoothing means which operates on the random noise-derived pulse sequence by un-reversing and reversing the polarity of a binary pulse sequence which is synchronous with a first clock, every half period of a second clock which is synchronous with and has a frequency one-half that of the first clock.

Kogaku's failure to disclose the claimed technique leads to a major difference in the performance of the respective systems. With Kogaku's technique, making Xn the exclusive logical sum of a random number sequence X1, X2, . . . , Xn, it is likely that a regularity will occur in the resulting random number sequence,

thereby reducing the randomness of the sequence.

However, with the claimed invention, even the appearance probabilities of 1/0 of the binary pulse sequence are deviated from each other. If the appearance probabilities of 1/0 in a constant period of the binary pulse sequence have the same deviation ratio, the imbalance of the output-smoothed binary pulse sequence is cancelled by outputting the positive and negative outputs alternately at a constant period, thereby equalizing the appearance probabilities of 1/0 without damaging the reducing the randomness of the resulting random number sequence.

As Kogaku neither discloses nor suggests a smoothing means as described in the amended claim 1, it cannot anticipate claim 1, which should therefore be allowable over Kogaku.

The amended claim 1 is the parent of claims 2 and 4, which should therefore be allowable along with claim 1.

The applicants assert that claims 2 and 4 should also be allowable on their own merits, as follows:

- claim 2 requires that the random pulse wave be generated so that the generation interval of the random noise defines the on/off time of pulse. There is nothing comparable to this requirement disclosed in Kogaku. As such, claim 2 should be allowable on this independent basis.
- claim 4 requires that the random pulse wave generation means comprises pulse generation means which receives the random noise, and is arranged such that its output state changes for every occurrence of random noise received at its input. Kogaku neither discloses nor suggests this functionality; therefore, claim 4 should be allowable on this independent basis.

It should be noted that each of claims 2-6 has been amended merely to clarify the language used in each claim.

All of the claims presently in the application are believed to be patentably distinct with respect to the cited art and to otherwise be in proper form for allowance. A Notice of Allowance is respectfully requested.

Respectfully submitted,

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